Energy Management System

National Energy Efficiency Conference

September 2012

PCMSB

Company Name	Petronas Chemical MTBE Sdn Bhd
Product	Methyl Tertiary Butyl Ether (MTBE) Propylene (C3=)
Capacity	300,000 MT/year MTBE 80,000 MT/year propylene
Build	1992
Location	Gebeng Industrial Area, Kuantan, Pahang
Specialty	The only dual feed plant in the world

Agenda

- Needs of EMS
- Background
- EMS Framework
- Energy Operating Parameters
- Energy Optimization Case Study
- Monitoring Cycle
- Benefits
- Key Success Factors
- Alignment to ISO 50001

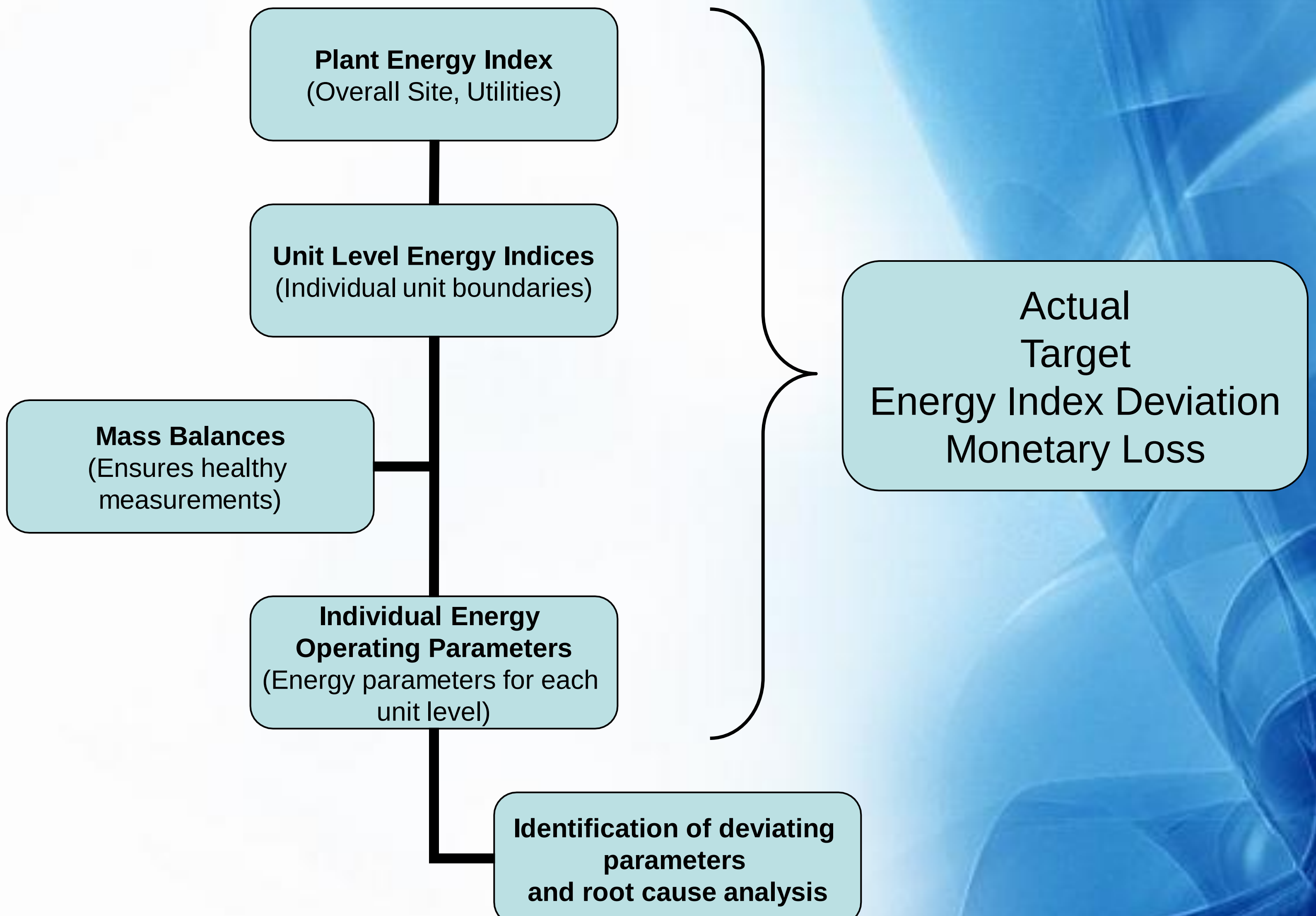
The Needs of Energy Management System

- To have an online energy monitoring system
- Cost effective plant operation (optimizing energy)
- Create awareness among staff on the importance of energy efficiency
- To monitor instantaneous energy optimization condition of the plant.

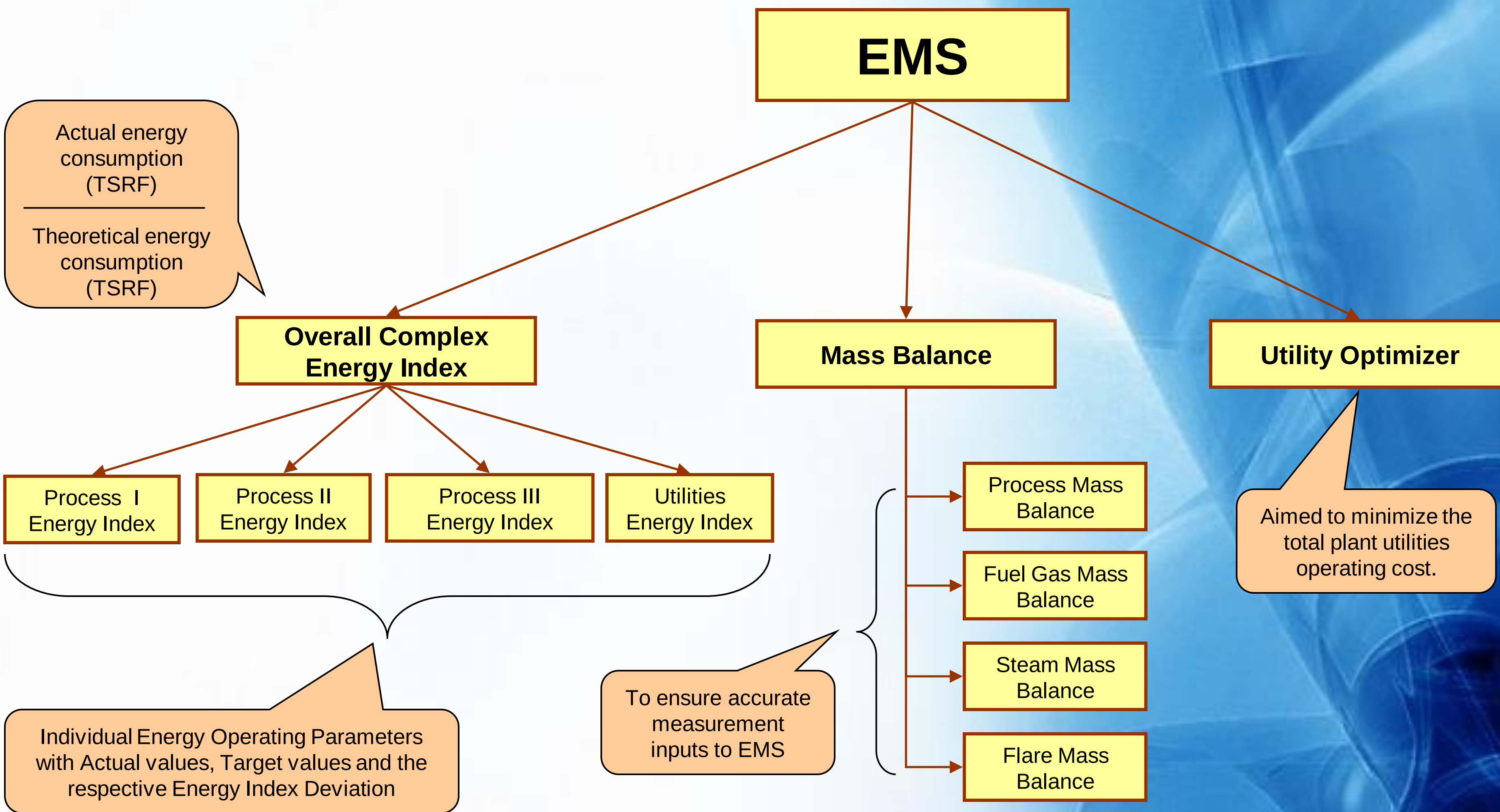
Background

- 2007 PCMSB Management initiative for systematic drive to improve Energy Performance
  - Definition of Energy KPIs
  - Identification of Energy Parameters and Optimization of Targets
  - Online Energy Dashboards
  - Training of Process Engineers and Operators
- 2008 Mecip Malaysia / Actsys Consortium awarded project to implement Energy Management System
- Jan 2009 Completion of Project

EMS Framework



EMS Framework – Petronas Chemical MTBE Sdn Bhd (PCMSB)



Energy Operating Parameters

EQUIPMENT	PARAMETERS	EFFECT
Column	✓ Reboiler Ratio ✓ Column Pressure	❑ Steam Usage
Reactor	✓ Inlet Temperature ✓ HC H2 Ratio	❑ Steam Usage at charge heater ❑ HC Feed
Steam Turbine	✓ Isentropic Efficiency	❑ Steam flow to turbine
Gas Turbine	✓ Exhaust to bypass stack ✓ Heat Rate	❑ Fuel Gas Flow
Compressor	✓ Polytropic Efficiency ✓ Spillback	❑ Fuel Gas Flow
Boilers	✓ Excess Oxygen ✓ Stack Temperature	❑ Fuel Gas Flow
Heaters / Furnace	✓ Excess Oxygen ✓ Stack Temperature	❑ Fuel Gas Flow

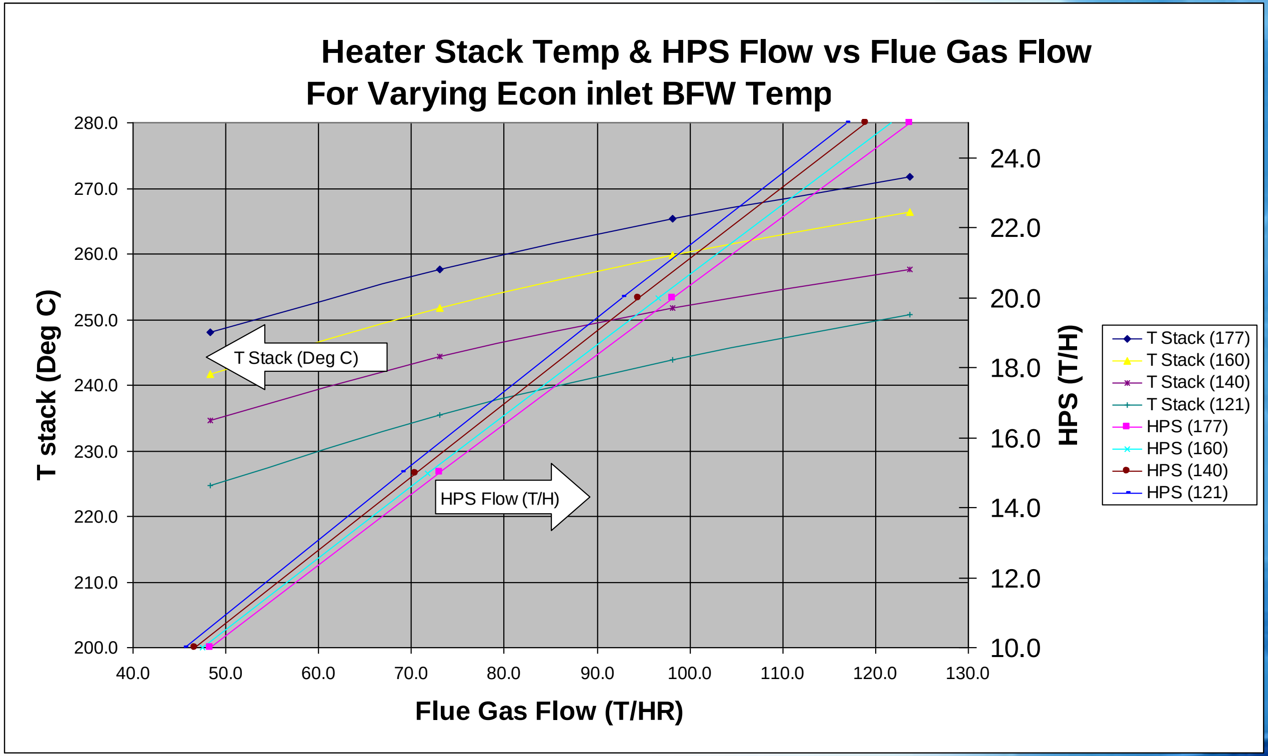
Case Study
Optimization WHB Economizer BFW Inlet temp

Aim : To determine the target heater stack temperature

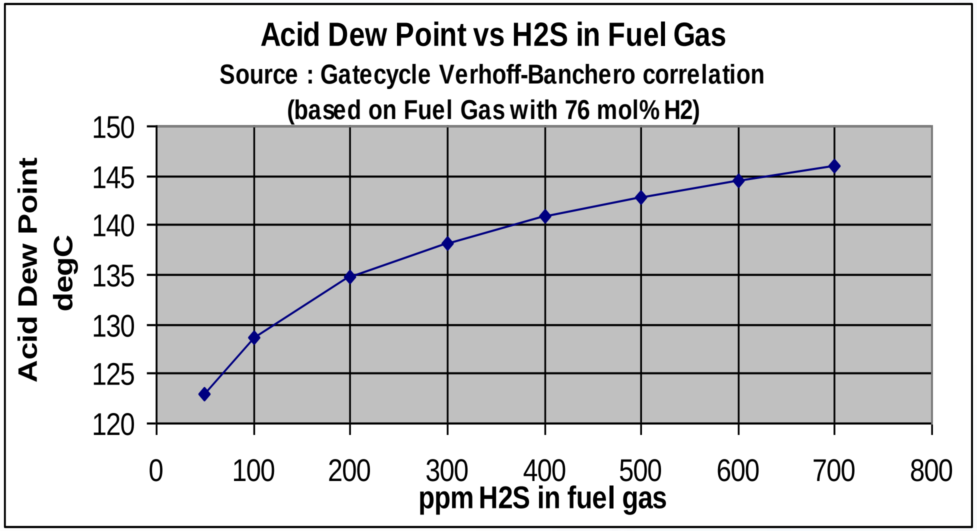
Observation : Stack temp and corresponding HPS production is

» a function of the load

» a strong function of the controlled BFW temperature.

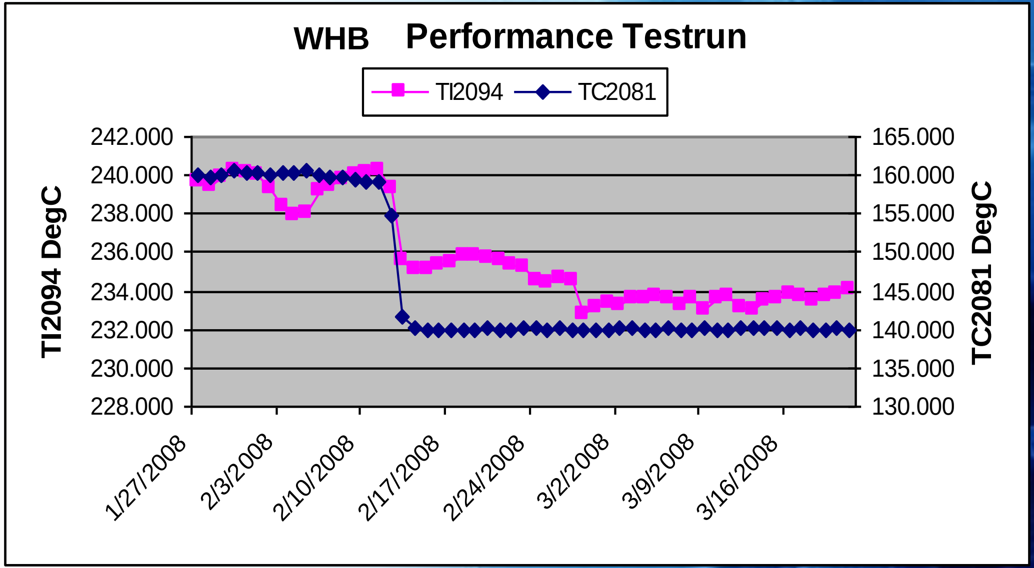


Case Study
Optimization WHB Economizer BFW Inlet temp

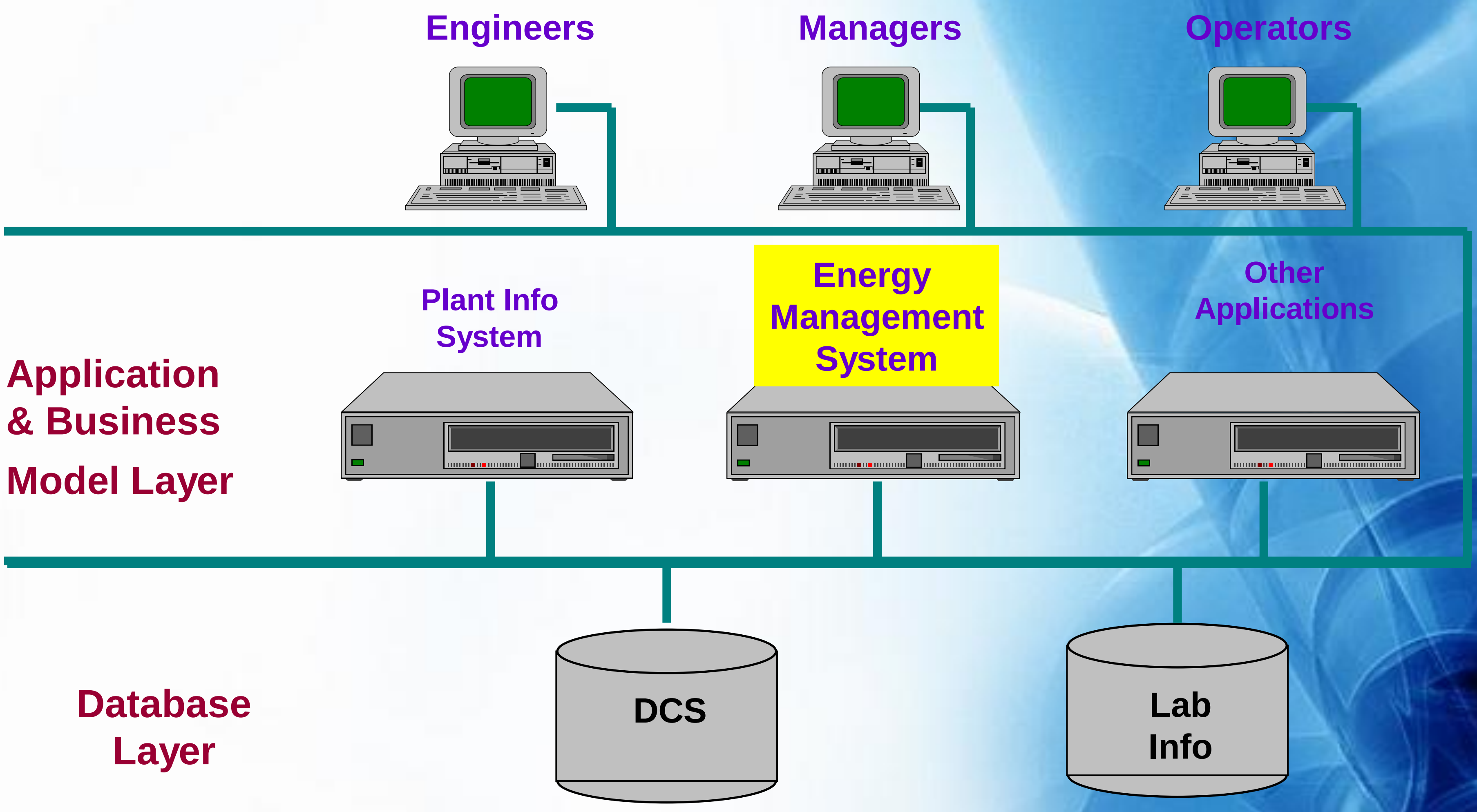


- BFW Initial Set point : 170 C
- Design Set Point : 177 C
- **Design Basis** : to protect against dew point corrosion in case of high H2S content in the fuel gas supply
- H_2S Analysis : maximum H2S content in fuel gas to be less than 30 ppm
- Fuel gas with only **30 ppm H2S** will produce flue gases with an acid dew point temperature around **120 degC**

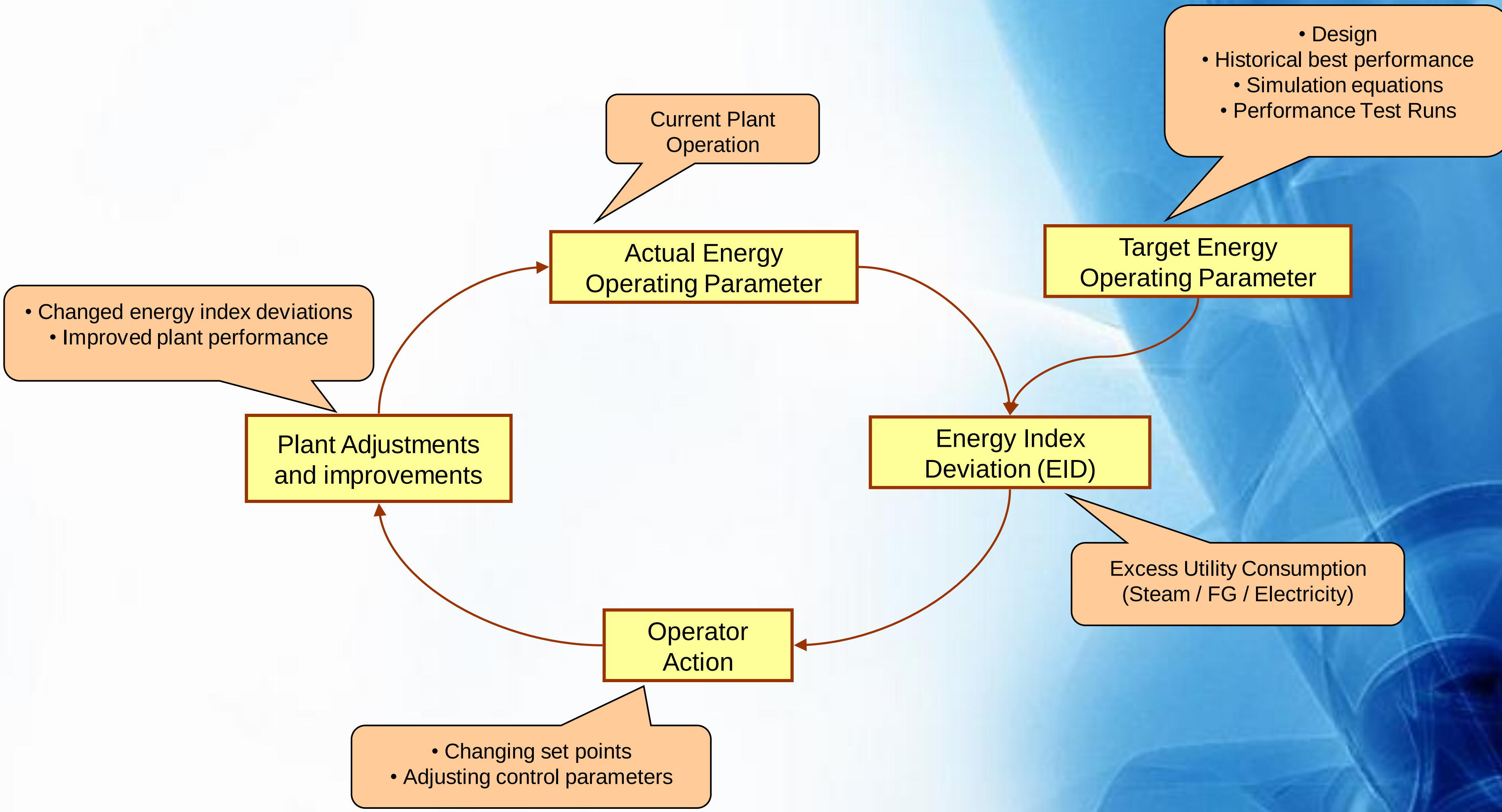
- **Testrun**
  Setpoint was lowered to 140 degC
- **Result**
  - stack temperature reduction from 240 to 234 degC.
  - increased HP steam production of almost 1 T/H
- **Savings**
  Fuel savings of RM350K/year



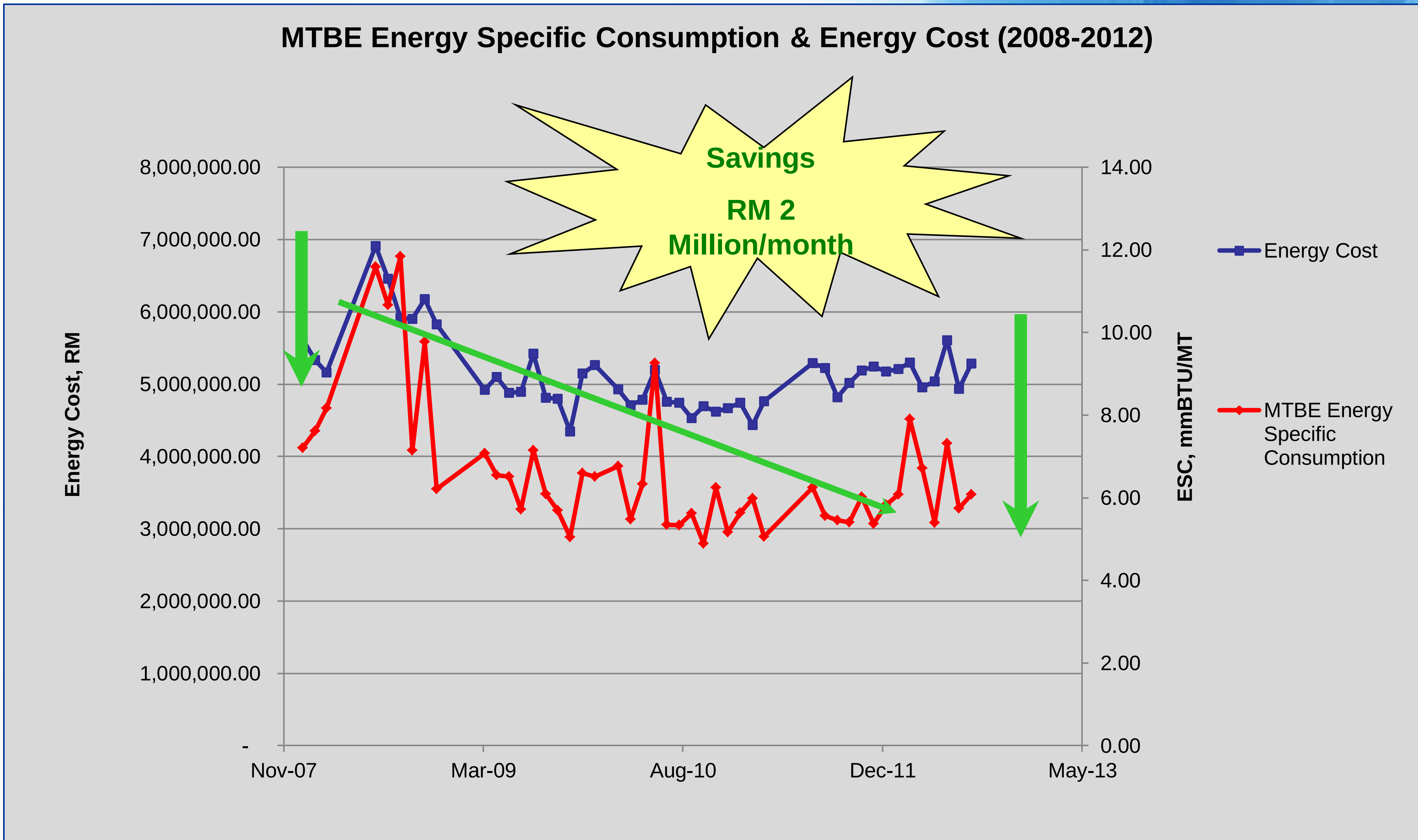
Energy Management System Monitoring Cycle



Energy Management System Monitoring Cycle



Realized Benefits from EMS



Other Initiatives

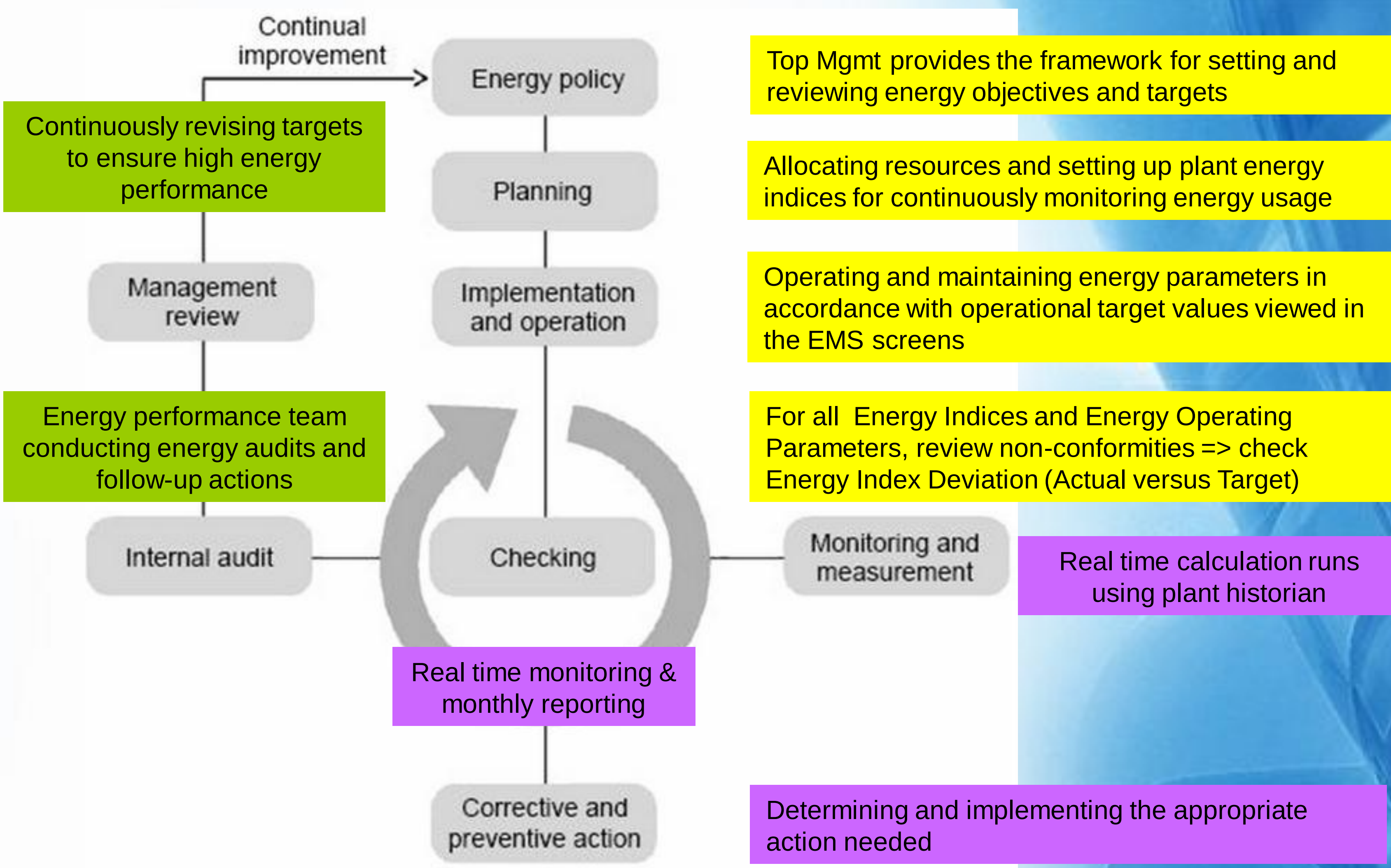
- Based on Utility Optimizer,
  - Change turbine driven pumps to motor driven (7Nos) – reduces LP steam venting by 10t/h – estimated savings of RM 2.5 million

- Benefits
  - Minimize Steam Loss
  - Minimize FG consumption
  - Reduced maintenance cost on turbines
  - Savings on turbine hot stand by steam consumption

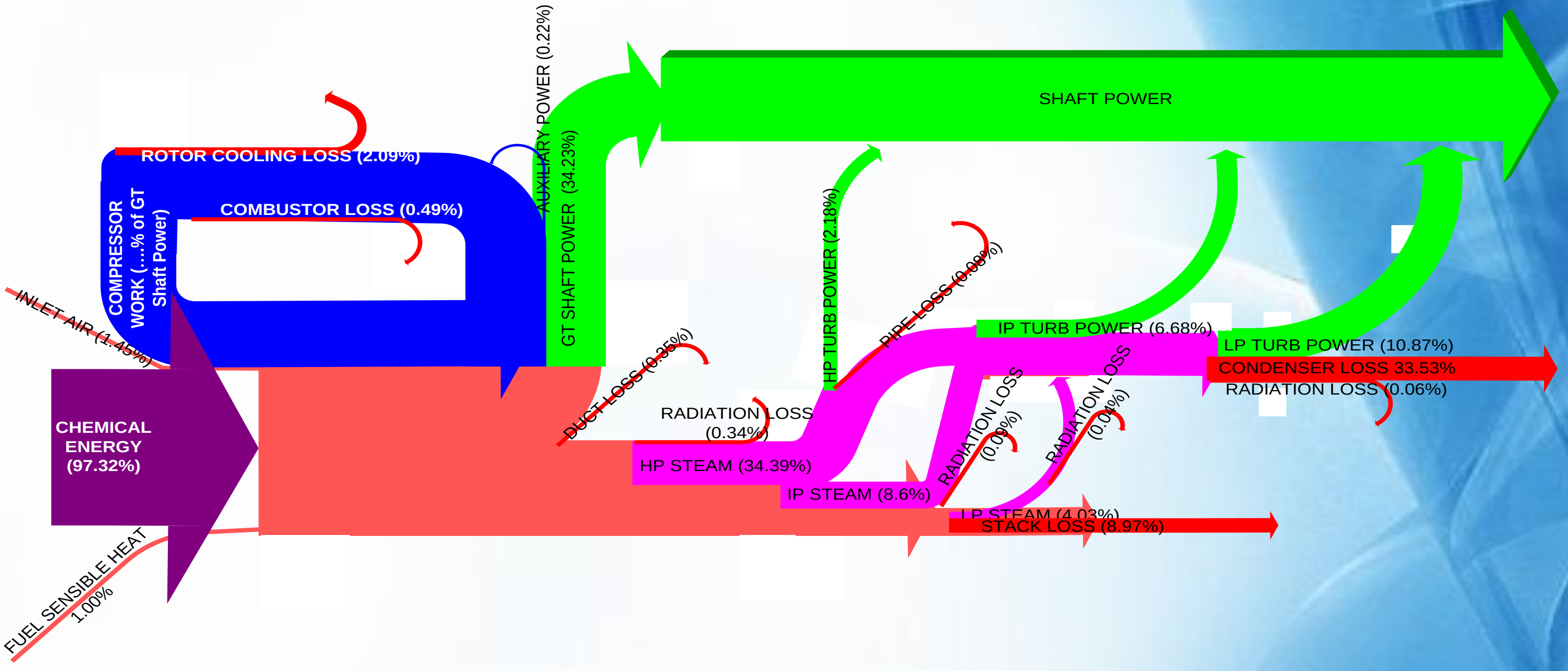
Key Success Factors

- Real time monitoring
- Automated process calculations
- Increased interaction between operators and managers
- Reliability of instruments (Mass Balance)
- Equipment performance (Efficiency)
- Continuous Energy Improvement
- Open and transparent communication between departments

ISO 50001 Energy Management System



Thank you



SHAFT POWER
ROTOR COOLING LOSS (2.09%)
COMBUSTOR LOSS (0.49%)
AUXILIARY POWER (0.22%)
GT SHAFT POWER (34.23%)
COMPRESSOR WORK (….% of GT Shaft Power)
INLET AIR (1.45%)
CHEMICAL ENERGY (97.32%)
FUEL SENSIBLE HEAT 1.00%
DUCT LOSS (0.25%)
RADIATION LOSS (0.34%)
HP STEAM (34.39%)
IP STEAM (8.6%)
LP STEAM (4.03%)
STACK LOSS (8.97%)
HP TURB POWER (2.18%)
PIPE LOSS (0.08%)
IP TURB POWER (6.68%)
LP TURB POWER (10.87%)
CONDENSER LOSS 33.53%
RADIATION LOSS (0.06%)
RADIATION LOSS (0.04%)